

5 Test Results and Discussion.....	94
5.1 Introduction	94
5.2 ANACAP® Finite Element Simulations.....	94
5.3 Response 2000® Cracked Section Analysis	96
5.4 C-Channel Static Tests.....	97
5.4.1 Introduction	97
5.4.2 Type I Girders.....	98
5.4.3 Type II Girders	111
5.5 C-Channel Fatigue Tests.....	117
5.5.1 Introduction	117
5.5.2 Type I Girders.....	118
5.5.3 Type II Girders	131
5.6 AASHTO Girder Test.....	138
6 Cost-Effectiveness and Value Engineering.....	143
6.1 Introduction	143
6.2 C-Channel Strengthening	143
6.2.1 Cost Analysis	143
6.2.2 Value Engineering Analysis.....	146
6.3 AASHTO Repair	151
6.3.1 Cost Analysis	151
6.3.2 Value Engineering Analysis.....	153
7 Design Guidelines.....	155
7.1 Introduction	155
7.2 CFRP Repair and Strengthening Systems	155
7.2.1 Carbon Fiber Reinforced Polymer (CFRP) Materials.....	155
7.2.2 Adhesive	156
7.3 Installation Recommendations.....	157
7.3.1 Shipping, Storage and Handling	158
7.3.2 Section Restoration.....	158
7.3.3 Surface Preparation.....	160
7.3.4 NSM CFRP System Installation.....	161
7.3.5 Externally Bonded Pre-cured CFRP Laminate Installation.....	162
7.3.6 Externally Bonded Wet Lay-up CFRP Installation.....	163
7.4 CFRP Strengthening Design Philosophy	164
7.4.1 Introduction	164
7.4.2 Design for Flexural CFRP Strengthening	165
7.5 CFRP Repair Design Philosophy	166
8 Conclusions	167
8.1 Summary.....	167
8.2 Conclusions.....	167
8.2.1 Strengthening of C-Channel Girders.....	167
8.2.2 Repair of AASHTO Girder.....	169
8.3 Future Work.....	170
Recommendations.....	171
Implementation	172
References	173
Appendix A – Design Example with Response 2000	179
A.1 Introduction.....	179
A.2 Problem Statement	179
A.3 Analysis of the Unstrengthened Section.....	181
A.4 Design of Longitudinal CFRP	182
A.5 CFRP Detailing.....	188
Appendix B – Parametric Study	190